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**REMARKS**

Applicants appreciate the thorough search conducted by the Examiner in examining the above-identified application. Applicants have endeavored to amend the application in a sincere effort to overcome the objections and rejections, and reconsideration is requested in view of the amendments above and the remarks below.

**Restriction Requirement**

The Examiner has restricted the invention to Group I, claims 1-21, drawn to an apparatus. Applicants elected Group I with traverse. Pursuant to this election, applicants have canceled claims 22 and 23, which were withdrawn from further consideration by the Examiner.

**Drawing Issues**

The Examiner has objected to the drawings due to a missing figure. Specifically, reference is made in the specification to Fig. 6; however, there was no Fig. 6 made available with the filing of the specification. Applicants concur that Fig. 6 was indeed referenced within the specification and claimed (refer: claim 13), but was inadvertently omitted from the filing package. "Fig. 6 is a diagram of an alternate schematic of the cross-flow injector." Specification, p.6, ll.23-24. Applicants attach hereto the informal drawing of Fig. 6 for the Examiner's review. Upon receipt, applicants will forward a formal drawing of Fig. 6 for the draftsman's review. As Fig. 6 has been defined and described within the instant application, and in the claims, no new matter is added to the specification by the correction of this inadvertent omission.

The Examiner has further noted that the drawings do not disclose a claimed heater pursuant to 37 C.F.R. § 1.83(a). Refer, Claim 11. Applicants note that explicit reference was made in the specification for heat application and a heater, to wit:

The liquids are introduced at a constant pressure above vacuum,  $P_2$ , and at the point of introduction are atomized by the fluid flow of the carrier fluid through the inlet nozzle 50. Mixing occurs in the throat and at the exit nozzle 42. *At this point, a mixture of atomized liquid and gas is ready to undergo optional heat application.*

Specification, p.9, ll.8-12 (emphasis added); and

*In addition to the cross-flow injector, a heated manifold may be attached to facilitate and effectively atomize and vaporize any fluid (liquid) precursor prior to its introduction into the reactor chamber.*

Specification, p.13, ll.2-4 (emphasis added).

Applicants have amended Fig. 2 to incorporate the optional heater design. As noted above, this optional design has been disclosed and described in the specification; therefore, no new matter is being added for this drawing correction. An amended informal drawing of Fig. 2 is attached hereto for the Examiner's review. Upon receipt, a formal drawing will be submitted to the draftsman.

#### **Claim Objections**

The Examiner questions claim 8's recitation that "said second pressure is an elevated and constant pressure above vacuum conditions," and the specification's delineation of the same (p.9, ll.2-4). The second pressure,  $P_2$ , is designed to be lower than the inlet pressure,  $P_1$ , but higher than the exit pressure,  $P_3$ . Specification, p.8, l.29-p.9, l.2. As long as the fluids injected into the throat are at a pressure less than  $P_1$ , they will be drawn into and through the throat region to the exit nozzle. Specification, p.9, ll.2-5. Applicants have amended claims 8 and 19 to more clearly define this design feature.

**35 U.S.C. § 112 Issues**

The Examiner has rejected claims 1-21 under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one of skill in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Specifically, the Examiner states that claims 1 and 13 recite "at least one aperture" and "at least one of said plurality of fluids," but has found little support in the specification for these statements. Applicants respectfully disagree. Applicants note that the specification contemplates and allows for the introduction of "at least one" fluid into the throat region, stating in the alternative, "*more than one fluid may be introduced* simultaneously through the cross flow injector." Specification, p.14, ll.14-15 (emphasis added).

At the critical point of the nozzle, throat 44, the fluids requiring atomization, which are typically introduced in liquid form, are injected. As depicted, *this may include introducing more than one liquid to the throat area 44 ...*  
Specification, p.8, ll.25-27 (emphasis added).

Applicants submit that the injection of "at least one of said plurality of fluids" is adequately supported by the above-citations from the instant disclosure. The reference above to "may include introducing more than one liquid" is clearly inclusive of introducing at least one liquid. Moreover, applicants may rely for disclosure upon the specification with original claims and drawings as filed. MPEP § 608.

In establishing a disclosure, applicant may rely not only on the specification and drawing as filed *but also on the original claims* if their content justifies it.  
MPEP § 608.04 (emphasis added).

Thus, independent of the above-cited specification support, applicants respectfully submit that claims 1 and 13 alone provide adequate disclosure for the statement "at least one of said plurality of fluids." Similarly, reference to "at least one aperture" is also sufficiently disclosed through the original claims, and supported by the drawings, Figs. 2-6, all of which depict *at least one* aperture. Applicants submit that claims 1 and 13 fully enable one of skill in the art to make or use a cross-flow injector having at least one aperture for injecting at least one fluid into the throat region of the apparatus.

The Examiner has further rejected claims 1 and 13 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as the invention. Specifically, claims 1 and 13 were found to be indefinite with respect to the transitional phrase "comprising." Claims 1 and 13 recite an "apparatus for delivering a plurality of fluids to a chemical vapor deposition chamber, having a cavity comprising... ." Applicants concur that this wording is indefinite, and have amended these claims to remove the reference to "a cavity."

The Examiner has rejected claims 5 and 17 under 35 U.S.C. § 112, second paragraph, as being indefinite regarding the terms "some" and "others." Applicants have amended these claims to the more definite quantifier "at least one." The specification teaches that the invention is "predominantly used in a TEOS application, but may be valid for *any* liquid precursor and dopant liquids being injected into a process chamber." Specification, p.13, ll.8-10 (emphasis added). Applicants have replaced the terms "some" and "others" with "at least one" to remove any issue of indefiniteness in these claims.

The Examiner has rejected claims 6 and 18 as being indefinite due to the phrase "said throat region further comprises two or more apertures." Applicants respectfully disagree. Claims 6 and 18 are dependent upon claims 1 and 13, respectively. Claims 1

and 13 teach of "at least one aperture" adjacent to the first and second ends of the throat region. Claims 6 and 18 expand the throat region claimed in claims 1 and 13, respectively, to have "two or more apertures." By this wording, claims 6 and 18 include a throat region having at least two apertures or possibly more than two apertures. Thus, whether the two apertures disclosed in claims 6 and 18 are inclusive of the "at least one aperture" claimed in claims 1 and 13 is immaterial. Clearly, if the "two apertures" phrase of claims 6 and 18 is not inclusive of claims 1 and 13's "at least one aperture," there would be three apertures in the throat region which would represent the "two or more apertures" phrase claimed in claims 6 and 18. Conversely, if the "two apertures" statement is inclusive of the "at least one aperture" of claims 1 and 13, then the throat region would simply have two apertures total, which remains appropriately claimed in claims 6 and 18 (and supported by claims 1 and 13's "at least one" description). Applicants respectfully submit that claims 6 and 18 are not indefinite or contradictory of claims 1 and 13 for these reasons, and remain in a condition for allowance.

**35 U.S.C. § 102 Issues**

The Examiner has rejected claims 1, 3-10, and 15-21 under 35 U.S.C. § 102(b) as being anticipated by Gwyn (U.S. Patent No. 4,397,422). Gwyn represents non-analogous art that teaches a paint-spraying device for mixing and spraying different colorants utilizing a venturi mixer system. Importantly, a venturi design has never been used for chemical vapor deposition processing, or made or adapted to receive a chemical vapor deposition carrier fluid, mix the carrier fluid with a different chemical vapor deposition fluid in the throat region, atomize chemical vapor deposition fluids and chemical vapor deposition gases, or output to a chemical vapor deposition chamber, as taught and disclosed in the instant invention. Applicants have amended claims 1, 3-10, 13

and 15-21 to more accurately define the application of the apparatus of the instant invention to chemical vapor deposition processing.

Furthermore, regarding claim 13 and those claims dependent upon claim 13, Gwyn does not teach or disclose an exit nozzle having the same diameter as the throat region, to wit: "said exit nozzle is an extension of said throat region having the same dimensions as said throat region." Claim 13, ll.16-17; Fig. 6. Thus, Gwyn cannot anticipate the instant invention claimed by claim 13. Applicants respectfully submit that claims 1, 3-10, 13, and 15-21, as amended disclosing direct application to chemical vapor deposition processing, are now placed in a condition of allowance over the cited prior art of Gwyn for the reasons stated above.

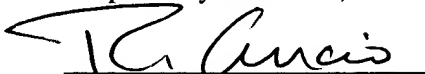
#### **35 U.S.C. § 103 Issues**

The Examiner has rejected claims 2, 11, 12 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Gwyn. Regarding claims 2 and 14, the Examiner states that it would have been obvious to one of ordinary skill in the art to alter the inlet and exit nozzle angles. Gwyn does not teach or disclose this application, nor is the paint-spraying apparatus described in Gwyn, having symmetrical inlet nozzle and exit nozzle angles adjoining the throat region, optimum for maintaining the necessary pressure differentials for atomization of chemical vapor deposition fluids and gases. Moreover, for the reasons cited above, independent claims 1 and 13 as amended, from which claims 2, 11, 12 and 14 depend, are patentably distinct over the cited prior art of Gwyn, and as such, put their corresponding dependent claims in a condition for allowance.

Applicants respectfully submit that the claims of the instant application are placed in a condition for allowance. Reconsideration of the rejections and allowance of the claims are respectfully solicited. Any matters which may be handled by telephone should be

directed to the undersigned at (203) 787 - 0595.

Respectfully submitted,



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**CERTIFICATE OF MAILING**

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date indicated below as first class mail in an envelope addressed to the Assistant Commissioner of Patents and Trademarks, Washington, DC 20231.

Name: Kara Laudano Date: 6-5-02 Signature: K. Laudano

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## VERSION WITH MARKINGS TO SHOW CHANGES MADE

### In the Claims

Claims 22 and 23 were canceled.

Claims 1-14 and 16-21 were amended as follows:

- 1 1. (Amended) An apparatus for delivering a plurality of chemical vapor deposition  
2 fluids to a chemical vapor deposition chamber, ~~having a cavity~~ comprising:  
3 an inlet nozzle having a first diameter adapted to receive a chemical vapor deposition  
4 carrier fluid as one of said plurality of fluids ~~as a carrier fluid~~, and configured to  
5 maintain a first pressure and a first temperature;  
6 a throat region having a first and second end, connecting to said inlet nozzle at said  
7 first end, having a second diameter less than said first diameter and adapted to  
8 receive said chemical vapor deposition fluid from said inlet nozzle, ~~and said~~  
9 throat region configured to maintain a second pressure and second temperature;  
10 ~~said throat region~~, and having at least one aperture adjacent to said first and  
11 second ends sufficient to allow for the introduction ~~mixing of at least one~~  
12 chemical vapor deposition fluid requiring atomization ~~at least one of said plurality~~  
13 ~~of fluids to said~~ chemical vapor deposition carrier fluid; and,  
14 an exit nozzle, ~~connect~~ connected to said throat region at said second end, having a  
15 third diameter greater than said second diameter to allow for a substantial  
16 decrease in exit pressure, ~~and~~ configured to maintain ~~a third~~ said exit pressure and  
17 third temperature for atomized chemical vapor deposition fluids and chemical  
18 vapor deposition gases, and adapted to introduce said chemical vapor deposition

19        fluids and said chemical vapor deposition gases in a chemical vapor deposition  
20        processing chamber.

1     2.     (Amended) The apparatus of claim 1 wherein said inlet nozzle having said first  
2        diameter is adapted to receive and funnel said chemical vapor deposition carrier fluid  
3        ~~tapers down~~ to said throat region second diameter, said inlet nozzle narrowing at an  
4        angle in the range of forty to sixty degrees.

1     3.     (Amended) The apparatus of claim 1 wherein said throat region is configured to  
2        operate at a critical Mach number of 1.0.

1     4.     (Amended) The apparatus of claim 1 wherein said second pressure and said  
2        second temperature are selected to present a condition for atomization of said chemical  
3        vapor deposition fluids.

1     5.     (Amended) The apparatus of claim 1 wherein said inlet nozzle, throat region, and  
2        exit nozzle are adapted to receive some at least one of said plurality of chemical vapor  
3        deposition fluids are as precursors, and others at least one of said plurality of chemical  
4        vapor deposition fluids are as dopants for a chemical vapor deposition process.

1 6. (Amended) The apparatus of claim 1 wherein said throat region further comprises  
2 two or more apertures adjacent to said first and second ends adapted to allow for the  
3 ~~introduction-mixing~~ of two or more of said plurality of chemical vapor deposition fluids  
4 to said chemical vapor deposition carrier fluid, each of said two or more of said plurality  
5 of chemical vapor deposition fluids introduced separately through individual apertures.

1 7. (Amended) The apparatus of claim 1 wherein said throat region is configured to  
2 maintain said first pressure to be greater than said third pressure to enhance atomization  
3 of said chemical vapor deposition fluids with said chemical vapor deposition carrier  
4 fluid.

1 8. (Amended) The apparatus of claim 1 wherein said throat region second diameter  
2 is adapted such that said second pressure is an-elevated-and-constant pressure above  
3 vacuum-conditions lower than said first pressure, allowing for chemical vapor deposition  
4 fluids to be injected into said throat region.

1 9. (Amended) The apparatus of claim 1 wherein said inlet nozzle is adapted to  
2 receive said chemical vapor deposition carrier fluid is-delivered-at a constant flow rate  
3 ensuring said second pressure being maintained constant through said throat region.

1 10. (Amended) The apparatus of claim 1 wherein said throat region is adapted to  
2 receive said plurality of chemical vapor deposition fluids ~~are introduced~~ separately and  
3 simultaneously without pre-mixing.

1 11. (Amended) The apparatus of claim 1 further comprising a heater at said exit  
2 nozzle for applying heat to said plurality of chemical vapor deposition fluids exiting said  
3 exit nozzle.

1 12. (Amended) The apparatus of claim 1 wherein said exit nozzle is adapted to  
2 receive from said throat region said chemical vapor deposition carrier fluid and said  
3 plurality of chemical vapor deposition fluids mixed and atomized together, said exit  
4 nozzle expanding to at said third diameter from tapers down to said throat region second  
5 diameter at an angle in the range of twenty to forty degrees.

1 13. (Amended) An apparatus for delivering a plurality of chemical vapor deposition  
2 fluids to a chemical vapor deposition chamber, ~~having a cavity~~ comprising:  
3 an inlet nozzle having a first diameter adapted to receive one of said plurality of  
4 chemical vapor deposition fluids as a chemical vapor deposition carrier fluid, and  
5 configured to maintain a first pressure and a first temperature;

6 a throat region having a first and second end, connecting to said inlet nozzle at said  
7 first end, having a second diameter less than said first diameter, and adapted to  
8 receive said chemical vapor deposition fluid from said inlet nozzle, said throat  
9 region configured to maintain a second pressure and second temperature; ~~said~~  
10 ~~throat region and~~ having at least one aperture adjacent to said first and second  
11 ends sufficient to allow for the ~~introduction-mixing~~ of at least one of said plurality  
12 of chemical vapor deposition fluids to said chemical vapor deposition carrier  
13 fluid; and,  
14 an exit nozzle, ~~connect~~connected to said throat region at said second end, having  
15 said second diameter, ~~and~~ configured to maintain said second pressure and said  
16 second temperature, such that said exit nozzle is an extension of said throat  
17 region having the same dimensions as said throat region, and adapted to introduce  
18 said chemical vapor deposition fluids and said chemical vapor deposition carrier  
19 fluid in a chemical vapor deposition processing chamber.

1 14. (Amended) The apparatus of claim 13 wherein said inlet nozzle having said first  
2 diameter is adapted to receive and funnel said chemical vapor deposition carrier fluid  
3 ~~tapers down~~ to said throat region second diameter, said inlet nozzle narrowing at an  
4 angle in the range of forty to sixty degrees.

1 16. (Amended) The apparatus of claim 13 wherein said second pressure and said  
2 second temperature are selected to present a condition for atomization of said chemical  
3 vapor deposition fluids.

1 17. (Amended) The apparatus of claim 13 wherein said inlet nozzle, throat region,  
2 and exit nozzle are adapted to receive some at least one of said plurality of chemical  
3 vapor deposition fluids as precursors, and others at least one of said plurality of  
4 chemical vapor deposition fluids as dopants for a chemical vapor deposition process.

1 18. (Amended) The apparatus of claim 13 wherein said throat region further  
2 comprises two or more apertures adjacent to said first and second ends adapted to allow  
3 for the introduction-mixing of two or more of said plurality of chemical vapor deposition  
4 fluids to said chemical vapor deposition carrier fluid, each of said two or more of said  
5 plurality of chemical vapor deposition fluids introduced separately through individual  
6 apertures.

1 19. (Amended) The apparatus of claim 13 wherein said throat region second diameter  
2 is adapted such that said second pressure is lower than said first pressure, allowing for  
3 chemical vapor deposition fluids to be injected into said throat region an elevated and  
4 constant pressure above vacuum conditions.

1 20. Amended) The apparatus of claim 13 wherein said inlet nozzle is adapted to  
2 receive said chemical vapor deposition carrier fluid ~~is delivered~~ at a constant flow rate  
3 ensuring said second pressure being maintained constant through said throat region.

1 21. (Amended) The apparatus of claim 13 wherein said throat region is adapted to  
2 receive said plurality of chemical vapor deposition fluids ~~are introduced~~ separately and  
3 simultaneously without pre-mixing.